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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER

JUBA JR, JOHN

ART UNIT	PAPER NUMBER
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2872

DATE MAILED: 04/13/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary

Application No.

10/649,192

Applicant(s)

ISLAM ET AL.

Examiner

John Juba, Jr.

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-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☐ Responsive to communication(s) filed on ____.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-42 is/are pending in the application.
4a) Of the above claim(s) ____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) ____ is/are allowed.
- 6) ☒ Claim(s) 1-10, 14-21, 25-30 and 32-42 is/are rejected.
- 7) ☒ Claim(s) 11-13, 22-24, and 31 is/are objected to.
- 8) ☐ Claim(s) ____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☒ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 27 August 2003 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
a) ☐ All b) ☐ Some * c) ☐ None of:
- ☐ Certified copies of the priority documents have been received.
 - ☐ Certified copies of the priority documents have been received in Application No. ____.
 - ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- ☒ Notice of References Cited (PTO-892)
- ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date 08/27/2003.
- ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. ____.
- ☐ Notice of Informal Patent Application (PTO-152)
- ☐ Other: ____.

DETAILED ACTION

Priority

Applicants' claim for the benefit of earlier filing under 35 U.S.C. § 120 is acknowledged, a reference to the parent applications being included before the first line of the specification.

As a matter of course, all of the references cited during the prosecution of parent application serial numbers 10/192,248 and 09/776,051 (to date) have been considered. Most of these are listed on Applicants' PTO-1449.

Information Disclosure Statement

Applicants' Information Disclosure Statement of August 27, 2003 has been fully considered. The citations indicating "undated" or date "unknown" have been lined-through as not being a proper citation. These references will not be cited on the face of any patent issuing from the instant application.

Specification

The specification is objected to as lacking a brief description of drawing Figures 10c and 10d. Appropriate correction of this informality is required.

The examiner suggests the following (or similar) title of the invention: Array of variable blazed gratings and optical processor using the same.

Claim Objections

☆The claims are objected to as including duplicate claims 32-38 on page 46. The claims have *not* been renumbered. A new consolidated listing of the claims (without duplicates) is required in response to this office action.

Claims 1-13, 16, 17, 20, 21, 22, and 26 are objected to because of the following informalities. Appropriate correction is required:

Claim 1, second line, “an portion” should read “a portion”. Claims 2 – 13 are objected to at least as inheriting the same informality through their dependency from claim 1.

Claim 3, third line, “comprises” should read “comprise”.

Claim 4, sixth line, “potion” should read “portion”.

Claim 16, third line, “comprises” should read “comprise”.

Claim 17, sixth line, “potion” should read “portion”.

Claim 17, sixth line, there is no antecedent basis for the signal as “the unmodulated signal”.

Claim 20, second and third lines, there is no antecedent basis for the signal as “the unmodulated signal”, and no first “portion” that would support “another portion”.

Claim 21, third and fourth, there is no antecedent basis for the signal as “the unmodulated signal”, and no first “portion” that would support “another portion”.

Claim 22, second line, there is no antecedent basis for the signal as “the unmodulated signal”, and no first “portion” that would support “another portion”.

Claim 26, sixth line, “potion” should read “portion”.

Claim Rejections - 35 USC § 112

Claims 8 and 34 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

Claim 8 is ambiguous as to which of "one or more semiconductor substrates" carries the controller.

Claim 34 is ambiguous as to which of "one or more semiconductor substrates" carries the separator.

Claim Rejections - 35 USC § 102

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

Claims 1, 3, 4, 7, 8, 14, 16 – 18, 25-27, 29, 30, 32, 35, and 38 are rejected under 35 U.S.C. 102(b) as being anticipated by Butler, et al (U.S. Patent number 5,905,571), as evidenced by Bloom, et al (U.S. Patent number 5,311,360), incorporated by reference into the Butler, et al (Col. 25, lines 15-12). Referring *initially* to Figure 1b, and noting the use of variable blazed gratings (Col. 13, lines 41-45; Col. 24, line 59 –

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Col. 27, line 62; and as perhaps more clearly illustrated in Bloom, et al in Figures 7 and 8), Butler, et al disclose an optical processing device comprising an optical signal separator (20), which may be a Fabry-Perot filter (Col. 6, lines 56 – 65), operable to direct a portion of an unmodulated optical signal (spectral signature) for modulation (selective diffraction); and an array of variable blazed gratings locate on a semiconductor substrate, the gratings operable to receive the portion of unmodulated optical signal and to modulate that signal based at least in part on a control signal received from a controller (14). Butler, et al fairly disclose that the electronics are integrated on the silicon substrate (Col. 7, lines 15-25; Col. 12, line 66 – Col. 13, line 10; Col. 15, lines 1–10).

With regard to claim 25 and its dependent claims, the processing element comprises and electronic processor (18) coupled by way of modulation means (14) to the array of gratings, and operable, based upon information received from the detector (16), to perform an electronic processing on at least a portion of the optical signal. The detector (16) receives a subset of the portion received by the gratings, which subset may be regarded as “another portion”.

Claims 1 - 7, 14 – 19, 25 – 29, 32, 33, 35 – 38, 39, 41, and 42 are rejected under 35 U.S.C. 102(e) as being anticipated by Lee, et al (U.S. Patent Appl. Pub. No. 2002/0079432 A1). Referring *initially* to Figure 16 and the associated text, Lee, et al disclose an optical processing device comprising an optical signal separator (1614) operable to direct a portion of an unmodulated optical signal for modulation (wavelength

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selection); and an array of variable blazed gratings locate on a silicon semiconductor substrate (100) having an embedded memory structure (para. [0051]), the gratings “operable to” receive the portion of unmodulated optical signal and to modulate that signal based at least in part on a control signal received from a controller. Lee, et al disclose a the grating elements (104) are responsive to the binary state of the underlying memory structure, which memory fairly comprehends a “controller” or processor within the specificity recited. The grating elements are arranged two-dimensionally such that they may be regarded as a linear array of linear gratings. Lee, et al disclose the elements as operable to selectively tilt in a plus and minus direction by 10° , and thus fairly discloses “variable” blazed gratings.

With regard to claim 4 – 6, 17, 26, 35 – 37, and 41 the grating elements comprise reflective, square “strips” (104; as distinguished from “ribbon”) disposed over an inner conductive layer (118) and having the recited widths and rotation angles. The elements are capable of 20° of rotation ($\pm 10^\circ$ about a quiescent orientation). Thus, tipping to either side fairly constitutes a “partial” rotation of 10° .

With regard to claims 2 and 15, the grating (1614) may be regarded as a spectral “beam splitter” within the specificity recited.

With regard to claim 39 and its dependent claims, the grating (1614) fairly comprehends a reflector within the specificity recited.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

Claims 9, 10, 20, and 21 are rejected under 35 U.S.C. 103(a) as being unpatentable over Lee, et al (U.S. Patent Appl. Pub. No. 2002/0079432 A1), in view of Tew (U.S. Patent Appl. Pub. No. 2002/0081070 A1). As set forth above for claims 1 and 14, Lee, et al disclose the invention substantially as claimed. Further, Lee, et al disclose operation of the gratings as an equalizer ("variable optical attenuator"; Fig. 17). However, Lee, et al do not disclose the controller as comprising an electronic processor operable to perform an electronic processing on at least *another portion* of the unmodulated signal (claims 10 and 21), and do not disclose an array of wavelength detectors operable to convert *another portion* of the unmodulated signal.

In the same field of endeavor, Tew discloses an array of spatial light modulators, that may be in the form of electrostatically deformable gratings (para. [0035]) and that may be operable in an analog mode (para. [0030]), arranged to form an optical equalizer. Tew teaches that it may be advantageous to arrange a detector (324) at a position of the beam dump to receive another portion of the signal. The opto-electrically converted signal can be passed to a detector processor (328) that cooperates with the device processor to provide information as to the content of the other portion, and thus as to the content of the diffracted portion.

It would have been obvious to one of ordinary skill in the art to couple an electronic processor to receive another portion of the unmodulated signal, in the interest of feeding back information as to the processed signal as suggested by Tew. One of ordinary skill would have recognized the rather obvious advantages of closed-loop processing as providing rapidly responsive, continuous control of the device operation.

With particular regard to claims 9 and 20, one of ordinary skill would have recognized that, where multiple wavelengths were processed with different transfer functions, it would have been appropriate to duplicate the detector structure for each wavelength band, so as to provide an *array* of wavelength detectors.

Claims 1 – 4, 7, 8, 39 – 42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bloom, et al (U.S. Patent number 5,311,360; hereinafter “Bloom ‘360”), in view of Bloom (“The Grating Light Valve: revolutionizing display technology”; Applicants’ reference “J” on Pg. 5/7; hereinafter “SiliconLight”). Referring *for example* to Figures 7 and 8 and the associated text, Bloom ‘360 discloses an optical processing device comprising an array of variable blazed gratings located on at least one semiconductor substrate and operable to receive at least a portion of an *unmodulated* “optical signal”, and to modulate that signal at least in part on a control signal received from a controller (address circuitry; Col. 4, lines 11-22). Bloom ‘360 teaches that the array of gratings is operable to provide a display. Thus, Bloom ‘360 discloses the invention substantially as claimed. However, with regard to claim1 and its dependent claims, Bloom ‘360 does not disclose a signal separator. With regard to claims 39+,

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Bloom '360 does not disclose an optical reflector operable to receive the modulated optical signal and to direct the modulated optical signal to an output, as recited.

In the same field of endeavor, SiliconLight disclose an array of grating modulators for use in a display. SiliconLight disclose a geometry (Fig. 10) whereby the grating modulators can be illuminated and at the same time can direct light to an output (projection screen). In order to provide a full color display, SiliconLight teach the use of dichroic color filters in the familiar "X-prism" construction.

It would have been obvious to one of ordinary skill in the art to arrange the array of variable blazed gratings of Bloom '360 with dichroic color filters, in the interest of permitting illumination of the grating array and synthesis of a full color display, as suggested by SiliconLight. It will be appreciated that any of the dichroic films may be regarded as a signal separator and a "reflector". A dichroic film is commonly referred to as a dichroic "mirror", and thus fairly comprises a "mirror" within the specificity recited.

Claims 40, 32, 35, and 38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bloom '360 and "SiliconLight", further in view of Silicon Light Machines ("The Scanned Grating Light Valve Display Architecture"; Applicants' reference "U" on Pg. 4/7; hereinafter "SLM"). As set forth above for claim 39, Bloom '360 and SiliconLight suggest the invention substantially as claimed. However, *to the extent that it may be held that the dichroic mirror of SiliconLight is not a "mirror"*, then the following applies. With regard to claims 32, 35 and 38, Bloom '360 and Silicon light

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disclose the invention substantially as claimed, including wavelength separation. However, these references do not disclose a linear array of gratings.

In the same field of endeavor, SLM disclose a similar geometry for illuminating grating arrays. SLM teach that a two-dimensional display can be achieved with fewer grating elements by use of a scanning architecture and linear arrays of gratings.

It would have been obvious to one of ordinary skill in the art to use the scanning architecture of SLM in the display of Bloom '360 and SiliconLight, in the interest of providing a display using fewer grating elements, as suggested by SLM. It will be appreciated that SLM suggest the use of a pivoting mirror to direct the light to an output (screen).

Allowable Subject Matter

Claims 11 – 13, 22 – 24, and 31 are objected to as being dependent upon a rejected base claim, but would be allowable if rewritten in independent form including all of the limitations of the base claim and any intervening claims.

Claim 34 would be allowable if rewritten to overcome the rejection(s) under 35 U.S.C. 112, second paragraph, set forth in this Office action and to include all of the limitations of the base claim and any intervening claims.

The following is a statement of reasons for the indication of allowable subject matter: The prior art, taken alone or in combination, fails to teach or fairly suggest, *in combination*,

a delay line operable to receive at least *another portion* of the optical signal and to delay transmission of the signal portion until another portion of the optical signal has been processed, as recited in claims 11, 22, and 31;

at least one optical amplifier capable of at least partially compensating for at least some of the losses associated with processing optical signals in the optical processing devices, as recited in claims 12 and 23; or

the arrangement particularly wherein the separator is located on the semiconductor substrate with at least one of the variable blazed gratings, as it is believed would be recited in claim 34.

Conclusion

The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

Tew (U.S. Patent number 6,633,694) disclose an optical switch comprising a plurality of macro-mirrors with variable inclination, and teach replacing each (relatively) large mirror with an array of much smaller mirrors operating as a variable blazed grating (Col. 10, lines 40-66).

Sweatt, et al (U.S. Patent Appl. Pub. No. 2002/0105725 A1) disclose a fixed grating, which may be blazed, in tandem with a processor-controlled variable grating.

Pilossof, et al (U.S. Patent Appl. Pub. No. 2002/0015230 A1) disclose an array of cantilever diffractive elements (Fig. 4) whose action can be simulated by a step-approximated grating array (Fig. 5).


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Any inquiry concerning this communication or earlier communications from the examiner should be directed to Examiner Juba whose telephone number is (571) 272-2314. The examiner can normally be reached on Mon.-Fri. 9 - 5.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mr. Drew Dunn can be reached on Mon.- Thu., 9 - 5.

The centralized fax phone number for the organization where this application or proceeding is assigned is (703) 872-9306 for *all* communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.


JOHN JUBA, JR.
PRIMARY EXAMINER
Art Unit 2872

March 18, 2004